

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Amendment of Part 2 of the Commission's Rules	)	ET Docket No. 00-258
to Allocate Spectrum Below 3 GHz for Mobile and	)	
Fixed Services to Support the Introduction of New	)	
Advanced Wireless Services, including Third	)	
Generation Wireless Systems	)	
	)	
Amendment of Section 2.106 of the Commission's	)	ET Docket No. 95-18
Rules to Allocate Spectrum at 2 GHz for Use	)	
By the Mobile-Satellite Service	)	
	)	
The Establishment of Policies and Service Rules	)	IB Docket No. 99-81
for the Mobile-Satellite Service in the 2 GHz Band	)	
	)	
Petition for Rule Making of the Wireless	)	RM-9498
Information Networks Forum Concerning the	)	
Unlicensed Personal Communications Services	)	
	)	
Petition for Rule Making of UTStarcomm, Inc.,	)	RM-10024
Concerning the Unlicensed Personal	)	
Communications Service	)	

**REPLY COMMENTS OF ARRAYCOMM, INC.**

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## **TABLE OF CONTENTS**

<u>I.</u>	<u>OVERVIEW/ARRAYCOMM'S POSITION</u>	1
<u>II.</u>	<u>COMMENTS</u>	3
<u>A.</u>	<u>FDD/TDD</u>	3
<u>B.</u>	<u>1910-1930 MHz: Unlicensed PCS Band (UPCS)</u>	5
<u>C.</u>	<u>2010-2025 MHz</u>	10
<u>1.</u>	<u>Background</u>	10
<u>2.</u>	<u>Issues/Comments</u>	11
<u>III.</u>	<u>CONCLUSION</u>	14

APPENDIX

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**REPLY COMMENTS OF ARRAYCOMM, INC.**

ArrayComm, Inc. (hereinafter ArrayComm) respectfully submits these reply comments in response to the Commission's *Further Notice of Proposed Rulemaking (Further Notice)* in the above-captioned proceeding. Herein, ArrayComm reiterates its call for the allocation of unpaired spectrum suitable for innovative wireless data services, such as those based on Time Division Duplex (TDD) technologies.

**I. OVERVIEW/ARRAYCOMM'S POSITION**

ArrayComm has reviewed the comments filed in this proceeding with special attention to the discussion of the deployment of complementary technologies. For example, in its initial response to the Further Notice, ArrayComm pointed out that some user needs would be best met

by employing Frequency Division Duplex (FDD) technologies, while other needs are best met by employing TDD. Still other needs may be addressed best by utilizing both TDD and FDD. As a result we expressed concern that, unlike the *Notice of Proposed Rulemaking (NPRM)* in this proceeding, which stressed the objective of providing for new technologies and espoused technical neutrality as the best way of reaching that objective, the *Further Notice* mainly restricted itself to a variety of reallocation options based on FDD. Understandably, perhaps, most commenting parties addressed the merits or disadvantages of what the Commission placed before them. One filing, however, did not. The TDD Coalition expressed its disappointment that the Commission had deviated from its emphasis on technical neutrality. Its comments sought to redirect attention back to this crucial issue, a position we wholeheartedly support.

In ArrayComm's initial comments in this proceeding, we predicted that proposals to reallocate spectrum would yield responses that, by and large, would be self-serving. That is not necessarily a pejorative assessment. Certainly, existing users are able to articulate how they employ a given piece of spectrum, how intensively they use it, and how that use benefits the public, with unmatched enthusiasm. Similarly, those who seek to acquire more spectrum can present evidence, anecdotal or analytical, to show the loss to the public that results from a lack of spectrum for their use. They can be relied on to make a case that their use is or will be superior to that of the incumbent.

ArrayComm observes that every claim for reallocation, however meritorious, probably should not be granted, because in many instances the incumbent's case is at least equally compelling. On the other hand, occupancy of spectrum is not an entitlement. It is rare to find a reallocation that will not have a negative impact on someone. That does not mean, however, that reallocation should not be undertaken. Some spectrum is underutilized; some spectrum has

future possibilities perhaps, but not present utilization. Some users can be readily relocated. Reallocation may necessitate finding a new home for the displaced, including some recompense for the hardship entailed in changing to an alternate frequency band.

The views expressed regarding the 1910-1930 MHz and 2010-2025 MHz bands are the subject of more detailed analysis by ArrayComm, since these are the bands that we believe are most promising candidates for reallocation for technologies, such as TDD. In these reply comments, we first address the broader issue of different technologies, notably FDD and TDD. Then, we assess the comments of others that pertain to the above frequency bands.

It remains clear to ArrayComm that TDD is one of the technologies for which a valid need for spectrum exists, and further, that spectrum is available. The facts support a total or partial reallocation of the spectrum at 1910-1930 MHz band and an outright reallocation of the 2010-2025 MHz band for advanced wireless services, including TDD. Both will enhance global compatibility.

## **II. COMMENTS**

### **A. FDD/TDD**

Although few parties discussed the comparative merits of FDD and TDD, it is generally accepted that these technologies should complement each other to serve the needs of the marketplace for voice and high-speed data. Among those addressing this matter was Siemens Corporation (Siemens). Siemens emphasized the need to develop a long-term spectrum management plan. An important ingredient in that plan is the promotion of global harmonization to create economies of scale and thereby reduce prices to the end user. To this end, Siemens suggests that “Operators should be permitted to use both FDD and TDD.”<sup>1</sup>

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<sup>1</sup> Comments of Siemens Corporation, p. 2.

Cingular Corporation and the Orange Group also recommend allocations for TDD. Cingular would reallocate both the 1910-1930 MHz bands and 2010-2025 MHz<sup>2</sup> to include TDD. Orange Group supports reallocation of the 1910-1920 MHz.<sup>3</sup> Ericsson refers to the suitability of 1910-1920 MHz (and 2385-2400 MHz) for advanced mobile wireless services, “primarily those services that could take advantage of unpaired spectrum technologies”<sup>4</sup> such as TDD.

Few of the commenting parties specifically criticize or even mention TDD as a technology. NEC Corporation (NEC), however, as part of its opposition to any reallocation of the 1910-1930 MHz band contends that introducing TDD into this band would reduce the flexibility of the band and thereby make it less valuable. NEC argues that not only would major carriers be unwilling to change their existing systems to TDD for a mere 20 MHz, but, argues NEC, there is no ready market for TDD to warrant development of equipment for this band.<sup>5</sup>

NEC’s comments are self-serving and contrary to the facts. Reallocating the 1910-1930 MHz band for licensed use to permit advanced mobile technologies, such as TDD, will enhance, not lower, the value of the band. If, as NEC seems to argue, unlicensed operation increases flexibility (and, therefore, value), then all spectrum should be unlicensed, a proposition that is untenable on its face. Carriers such as Cingular have shown an interest in TDD in the United States; carriers in much of the rest of the world currently employ TDD. We are convinced that experience abroad demonstrates that once an allocation for TDD is made, operator interest and equipment development follow closely behind.

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<sup>2</sup> Comments of Cingular Wireless, see Cingular’s Proposed Band Plan, p. 11.

<sup>3</sup> Comments of Orange Group, p. 4.

<sup>4</sup> Comments of Ericsson Inc., p. 4.

<sup>5</sup> Comments of NEC Corporation, p. 20.

## **B. 1910-1930 MHz: Unlicensed PCS Band (UPCS)**

This is one of the bands that the Commission indicated might be suitable for new advanced wireless services.<sup>6</sup> The band has been subdivided into two 10 MHz segments: 1910-1920 MHz is available for asynchronous (data) operations; 1920-1930 MHz is used for isochronous (voice) operations. The entire band is unlicensed. There is a question as to whether the upper portion is used to any great extent. According to FCC records, there is no equipment authorized to operate in the lower portion, so there is little question that it is not presently utilized.<sup>7</sup>

A number of comments from users of 1920-1930 MHz, from manufacturers, and from would-be users object to any reallocation of 1910-1930 MHz.<sup>8</sup> Some object on the grounds that 1920-1930 MHz is heavily used. Nortel Networks, Inc. (Nortel) asserts that it has 100,000 users of UPCS devices operating in this sub-band. Moreover, Nortel states: “This equipment is operated in environments where reliability of service is paramount, but for which a licensed service is inappropriate.”<sup>9</sup> ArrayComm would point out that the concept of utilizing an unlicensed band to serve high priority uses is contrary to conventional wisdom. “Unlicensed” implies that everyone is welcome but everyone enters at his or her risk. If the spectrum becomes too congested for any particular user, that user should seek a licensed service and enjoy the protection from interference it affords. Users requiring a high degree of channel access and service reliability typically utilize licensed spectrum.

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<sup>6</sup> See para. 11 of this FNPRM.

<sup>7</sup> Ibid para. 10.

<sup>8</sup> These include UTAM, WINForum, Motorola, NEC, Nortel, iBEE, UTStarcom.

<sup>9</sup> Comments of Nortel Networks, Inc., p. 4.

NEC cites Infotech, the Wireless Business Connection (First Quarter 2001 Report) that claims nearly 220,000 handsets operate in the isochronous band.<sup>10</sup> Motorola Inc. (Motorola), without any source reference claims that more than 400,000 users depend on 1920-1930 MHz isochronous devices.<sup>11</sup> Of course, if we could distinguish in these estimates between “users” and “devices” a degree of rationality might emerge. However devices are counted to account for Nortel’s number or NEC’s number and certainly Motorola’s, it is disingenuous to create the impression that there are hundreds of thousands of devices in this band. When NEC asserts that “Replacement costs for new equipment [if existing isochronous users had to relocate] could be expected to range from \$800 to \$1500 per handset”<sup>12</sup> one may wonder whether the supposedly dire straits of the telecommunications industry have not been exaggerated.

Thus, on a marketing basis there seems to be disagreement about its size. Whatever the facts, it must be borne in mind that this is an unlicensed band. A key *quid pro quo* is that the spectrum is free – no auctions – but neither does it carry any of the protections that adhere to a licensed service.

On a technical basis, it is not clear whether TDD operations would cause interference to UPCS operations on 1920-1930 MHz. Cingular does not appear to think so.<sup>13</sup> The fact that PCS systems operate at 1930 MHz in evident compatibility with UPCS systems indicates, at the very least, that interference-free conditions can exist. If the Commission were to decide to reallocate the 1910-1930 MHz band to other purposes, the issue of interference to UPCS would be moot.

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<sup>10</sup> Comments of NEC, p. 4.

<sup>11</sup> Comments of Motorola, Inc., p. 20.

<sup>12</sup> NEC America, Inc., p. 14, fn 33.

<sup>13</sup> See fn 2, *supra*. Cingular’s Proposed Band Plan calls for 1915-1925 MHz for TDD.



Of course, ArrayComm is aware that other problems for these users would require resolution but interference would not be one of them.

If, however, only the 1910-1920 MHz band were reallocated, then the question of interference to these 1920-1930 MHz users would need examination, analysis and resolution. The fact that UPCS operations are typically in-house or in-building is encouraging and, as noted, the presence of PCS systems operating at 1930 MHz and above without guard bands or other special techniques to deal with interference is also encouraging. ArrayComm is prepared to deal with adjacent channel interference in any manner the Commission might direct.

As far as the 1910-1920 MHz band is concerned, the “haves” who operate in the 1920-1930 MHz spectrum (or those who supply equipment to the “haves”) present a game plan whose audacity is, if nothing else, impressive. The non-existence of users of this 10 MHz is not denied; it is essentially ignored. Instead, petitions have been filed<sup>14</sup> that seek to expand isochronous operation into the 1910-1920 MHz band and to modify the existing Part 15 Rules to increase power and amend other “etiquettes” so as to widen the area of operation to which UPCS users now are limited. As ArrayComm had predicted in its comments, as an unlicensed band, *de facto* control of the 1910-1920 MHz band would still remain in the hands of UTAM.<sup>15</sup> Those who want to avoid an auction in this band certainly agree with PCS users<sup>16</sup> and their manufacturers<sup>17</sup> who have no interest in having to deal with a higher-powered service. Again, the UPCS community apparently believes that it can co-exist with PCS systems operating at 1850-1910

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<sup>14</sup> See, for example, Petition of WIN Forum for Rulemaking RM-9498; Petition for Rulemaking RM-10024 by UTStarcom, Inc.

<sup>15</sup> See p. 6.

<sup>16</sup> See for example, Comments of CTIA at p. 3: “...the Commission must ensure that whatever services are authorized in this band do not interfere with adjacent PCS services.”

<sup>17</sup> Motorola doc., pp. 15-18.

MHz as it does with such systems at 1930-1990 MHz. The relationship between UPCS and PCS certainly appears to be felicitous.

ArrayComm understands that some UPCS users veer away from a licensed service, because they fear they could not prevail in an auction. ArrayComm has been in circumstances in which it has had to compete with entities whose resources are substantially greater.

ArrayComm, however, cannot countenance those who use unlicensed spectrum as a shield or guard band to protect other services. Their primary position is: No Reallocation. Their “fall back” position is: Any reallocation must guarantee protection from interference. It is rare to find a party with this view that acknowledges that interference between adjacent channel systems confers a dual responsibility on both to resolve the situation.<sup>18</sup>

The general thrust of the comments from those who have primary PCS interests is to insist that guard bands, many megahertz wide, must be established by the party seeking to operate a licensed service adjacent to PCS. A number of comments echoed this theme.

ArrayComm recognizes that the issue of interference both in-band and adjacent channel is crucial. The coexistence between present users and new entrants should be the goal. It should be understood that there are numerous varieties of instances requiring the deployment of “cures” to achieve coexistence. For example, if two systems sought to use the same frequency, the first “cure” that would be considered would be geographic separation. A primary principle of frequency reuse is to create areas of operation that do not overlap, such that the different users of the same frequency can co-exist. Geographic separation can be accompanied by engineering techniques such as directional antennas, shielding and other means to reduce the area of potential interference, or, increase the area of coexistence.

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<sup>18</sup> Wireless Communications Division of the Telecommunications Industries Association at p. 4.

The potential “cures” may be somewhat different, but we would approach the question of adjacent channel interference in the same manner. Clearly, if it is possible to provide geographic separation between adjacent channel users, coexistence is relatively easy to achieve. Again, it may be necessary to apply additional engineering practices to alleviate problems even further.

What must be recognized is that there are an infinite number of systems today which have different power levels, antennas at different heights, all operating on adjacent channels and co-existing very effectively. In some instances, additional safeguards such as filters, are being used to improve spectrum utilization for all parties. Yes, in some circumstances it has been necessary to employ guard bands. The point is that there is no one “cookie-cutter” answer to attaining successful coexistence. Even where the adjacent channel user on either side is the same, PCS for example, the interference considerations are different. The 1850-1910 MHz band should not be treated the same as the 1930-1990 MHz band. One is populated by base stations; the other by mobiles. One has stations generally at fixed locations; the other operates generally throughout a given area. Yet the same entity will have a license to operate in both bands. It is obvious that different approaches are needed to maximize coexistence for each band. To suggest a pre-ordained guard band is the sole solution is plainly too simplistic.

Since Motorola made the most extensive filing and encapsulated many of the arguments of other FDD adherents, ArrayComm feels compelled to address its contentions. While there are truths, there are also opinions set forth as truths, and “unprovens” rendered as Gospel. ArrayComm has attached an Appendix to these Reply Comments that discusses the source papers that Motorola cites as proof that different technologies cannot, as a practical matter, coexist on adjacent channels. It is ArrayComm’s contention that these papers hardly support Motorola’s conclusion. In fact, with care, coexistence is distinctly possible, if not probable.

## **C. 2010-2025 MHz**

### **1. Background**

This is a sub-band of 1990-2025 MHz which is allocated in Region 2 for MSS on a co-primary basis with Fixed and Mobile services. Since 1992, when this allocation was adopted at the World Radio Conference (WRC), the United States has tried to persuade other Administrations to extend the MSS component, 1980-2010 MHz paired with 2170-2200 MHz, to 2025 MHz on the Earth-to-Space side and to 2165 MHz on the Space-to-Earth side. The situation has not changed internationally. Nevertheless, at the urging of a number of US companies who hope to be involved in the manufacture and/or operation of satellites, the Commission decided to accept applications and grant authorizations for 2GHz MSS systems.

Thus, the Commission granted eight licenses and awarded equal spectrum to each licensee. Squabbles have ensued among these licensees and have since extended to satellite licensees in bands other than 2 GHz who have joined in. The arguments have centered around the amount of spectrum (some believe the authorized MHz per licensee is inadequate to create a viable service) and what should be done with any abandoned spectrum, i.e., spectrum that would be forfeited by a licensee who failed to meet specified milestones.

One of the licensees, New ICO Global Communications (Holdings) Limited (“New ICO”) has sought rule changes to permit the rendition of ancillary terrestrial operations to supplement its satellite services. It asserted, as referenced by ArrayComm in its comments, that this extension of satellite service was necessary to the economy viability of mobile satellites.<sup>19</sup>

Just prior to the grant of these 2 GHz licenses, the Cellular Telecommunications & Internet Association (CTIA) filed a petition seeking reallocation of this spectrum for Advanced

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<sup>19</sup> ArrayComm comments, p. 8.

Wireless (terrestrial) communications. The grant of the licenses, in essence, mooted this petition but CTIA subsequently filed a Petition for Reconsideration and a Petition for Rulemaking.<sup>20</sup>

## **2. Issues/Comments**

The facts regarding present usage of this band are different than those that prevail at 1910-1930 MHz, or, more precisely, at 1920-1930 MHz. In the MSS case, there are no operating systems at 1990-2025 MHz. Instead there are would-be operators and system designers along with their affiliated trade associations. Their arguments are essentially prospective: We have invested substantial time and money; we can succeed. Since, as referenced above, they were generally unhappy at the amount of spectrum each was to receive as a 2 GHz MSS licensee, they are adamantly opposed to any incursion by non-satellite parties.<sup>21</sup> Not only do they endeavor to make a positive case for MSS's future but there is also a claim that 3G is, in actuality, a myth, that there is no market for the projected services (3G) that would be provided.<sup>22</sup>

At 1920-1930 MHz there is usage although it is not clear how much. That, however, to the major PCS players is subservient to the 1910-1930 MHz band's continued existence as a guardband to protect PCS operations adjacent thereto. In contrast, the MSS emphasis is to hold on to the allocated spectrum until MSS finds a market niche or until another use, related or not, is uncovered. The carrier side, however, unhappy that United States Government spectrum will not be available imminently, and resigned to being foreclosed from 2500-2690 MHz, now seeks frequencies somewhere and anywhere to meet the 160 MHz shortfall which the industry forecast in its preparation for WRC 2000. This MSS spectrum is an attractive target.

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<sup>20</sup> CTIA Comments, pp. 4 and 5 summarize the rationale for CTIA's filings.

<sup>21</sup> See, for example, the comments of Satellite Industries Association.

<sup>22</sup> Comments of the Boeing Company.

There were comments filed by the carrier community that would reallocate some or all of the 2GHz MSS spectrum for 3G.<sup>23</sup> A proposal that would reallocate 2010-2025 MHz specifically to TDD was also submitted.<sup>24</sup> Even more encouraging, almost none of the proposals to reallocate some or all of the 2 GHz MSS spectrum on a paired basis seems to include this 15 MHz.

Thus, the main obstacle is the case that can be made by the satellite community itself. As ArrayComm pointed out in its Comments, the United States Government sought at domestic and international forums to pave the way for MSS to become a reality. The promise of global ubiquity was quite exciting. While ITU established an allocation for a satellite component of 3G, it has resisted further implementation. It has turned out that global coverage into sparse, remote populations needs an urban underpinning to be economically viable. However, cellular service established itself even in relatively remote urban areas with unexpected rapidity and captured that market MSS had hoped for itself.

This failure of MSS to flourish has been a blow to the United States as well as to the individual companies involved. A handful of those initial MSS adherents still survive; they have been joined by other major US companies that have collateral experience in designing, constructing and operating satellites. Their technical competence is beyond question. It is tempting, therefore, for the Commission at the behest of those companies to provide them with another chance to succeed.

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<sup>23</sup> See Comments of AT&T Wireless Services and Verizon Wireless.

<sup>24</sup> See Cingular, *ibid* fn 2.

If there were idle spectrum available, if the needs of others were less real, if the ability of the US telecommunication manufacturers to compete here and abroad were not under such pressure then perhaps the country could take such a gamble. The facts, however, are clearly otherwise. ArrayComm's proposal would still leave 40 MHz available for mobile satellite use. This may well limit the number of entrants; it may necessitate a rigorous selection process to determine which MSS services will be nurtured. In the final analysis, however, the United States, and specifically, the Commission cannot continue to reserve vast sums of spectrum that will be essentially dormant for several years, even under the most optimistic circumstances, at the expense of other critical needs.

### III. CONCLUSION

In this FNPRM the Commission has moved forward by presenting a variety of possible uses for spectrum, many of which would involve reallocation. Although ArrayComm regrets that these proposals are not specifically designed to promote technical innovation, there are opportunities for companies, such as ArrayComm, to identify spectrum suitable for TDD use. The spectrum ArrayComm selected requires some reallocation; the impact on those who occupy that spectrum, or, who are eligible to occupy it appears to present relatively manageable problems. Both 1910-1930 MHz and 2010-2025 MHz are part of a larger tapestry designed to meet current and future wireless needs. However, steps to confirm their availability and the initiation of the necessary regulatory actions to effect changes should not be delayed.

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